Notice of Allowability	Application No.	Applicant(s)	
	09/552,292	ROBISON, ARCH D.	
	Examiner	Art Unit	
	Eric B. Kiss	2192	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the reply filed 31 August 2005*.

2. ☒ The allowed claim(s) is/are *1, 3-6, 10-13, and 15-17, renumbered as 1-12*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *20050915* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

TUAN DAM
SUPERVISORY PATENT EXAMINER

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Ashley R. Ott (Reg. No. 55,515) on 15 September 2005.

The application has been amended as follows:

IN THE CLAIMS:

- **Please cancel claims 2 and 14.**
- **Please amend claims 1, 3, 4, 10, 13, 15, and 16 as follows.**

Claim 1. (Currently Amended) For a computer-executable program that operates on a data structure, where the data structure must have a required state at selected program points, a computer-implemented method of transforming said program comprising:

analyzing the program to determine the state of said data structure at said selected program points, wherein the data structure stores items on a first-in-last-out basis;

partitioning said determined state at each said program point into components that may each be set separately;

determining operations to be inserted into the program in order to set each component of the state at each selected program point based on flow equations for an up-safety and a down-safety of setting the state at each selected program point, wherein the operations assure that the data structure will be in the required state at the selected program points; and

placing said operations to eliminate partial redundancies of said operations.

- **In the first line of Claim 3, please replace "The computer-implemented method of claim 2" with --The computer-implemented method of claim 1--.**

- **In the first line of Claim 4, please replace "The computer-implemented method of claim 2" with --The computer-implemented method of claim 1--.**

Claim 10. (Currently Amended) For a computer-executable program that operates on a data structure, where the data structure must have a required state at selected program points, a computer-implemented method of transforming said program comprising:

analyzing the program to determine the state of an instance of said data structure at said selected program points, wherein the data structure stores items on a first-in-last-out basis;

partitioning said instance of said data structure into components;

determining a set of one or more operations to be inserted into the program in order to set each component of the state at each selected program point based on flow equations for an up-safety and a down-safety of setting the state at each selected program point, wherein the operations assure that the data structure will be in the required state at the selected program points;

computing placement of the set of operations to eliminate partial redundancies; and

inserting the set of operations at said program points according to the computed placement.

Claim 13. (Currently Amended) A machine-readable medium having a set of instructions, which when executed by a set of one or more processors, causes said set of processors to perform operations comprising:

analyzing a program that operates on a data structure, which must have a required state at selected program points in the program, to determine the state of an instance of said data structure at said selected program points, wherein the data structure stores items on a first-in-last-out basis;

partitioning said instance of said data structure into components;

determining a set of one or more operations to be inserted into the program in order to set each component of the state at each selected program point based on flow equations for an up-safety and a down-safety of setting the state at each selected program point, wherein the operations assure that the data structure will be in the required state at the selected program points;

computing placement of the set of operations to eliminate partial redundancies; and

inserting the set of operations at said program points according to the computed placement.

- **In the first line of Claim 15, please replace "The machine-readable medium of claim 14" with --The machine-readable medium of claim 13--.**

- **In the first line of Claim 16, please replace "The machine-readable medium of claim 14" with --The machine-readable medium of claim 13--.**

---END OF AMENDMENT---

2. The following is an examiner's statement of reasons for allowance: The prior art of record fails to teach or fairly suggest the combination of partial redundancy elimination based on up-safety and down-safety flow calculations and setting the state of a data structure that stores data on a first-in-last-out basis (*e.g.*, a stack). The prior art contains such known practices as code motion, which does aim to eliminate unnecessary calculations (which may be considered partial redundancy elimination) through the careful movement/insertion of instructions consistent with safety constraints (such techniques are discussed, for example, in Knoop et al., "Optimal Code Motion: Theory & Practice," made of record with this Office action). However, such techniques do not appear to be applicable to setting the state of a first-in-last-out data structure, in the context of the limitations in each of independent claims 1, 10, and 13, and accordingly, this combination of features is not taught or fairly suggested.

3. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Eric B. Kiss whose telephone number is (571) 272-3699. The Examiner can normally be reached on Tue. - Fri., 7:00 am - 4:30 pm. The Examiner can also be reached on alternate Mondays.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Tuan Dam, can be reached on (571) 272-3695. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any inquiry of a general nature should be directed to the TC 2100 Group receptionist: 571-272-2100.

EBK /EBK
September 15, 2005

TUAN DAM
SUPERVISORY PATENT EXAMINER